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ABSTRACT

To test student reactions to compressed-speech lectures, tapes for a general education course in oral communication were compressed to 49 to 77 percent of original time. Students were permitted to check them out via a dial access retrieval system. Checkouts and use of tapes were compared with student grades at semester's end. No significant difference in grades was apparent among those who used tapes and those who did not. Students also stated that they preferred compressed tapes, although not by large margins. (SK)

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ORAL ROBERTS UNIVERSITY

College Students' Preference for Compressed Speech Lectures

by

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PROBLEM

It is apparent that students at ORU, and those at other colleges making extensive use of dial access capabilities, spend a great deal of time listening to taped lectures. It is equally apparent that the human voice normally does not communicate information at the same speed as print. Nevertheless, there are advantages to using a taped lecture rather than a printed version of it, particularly since it permits insertion of visual materials at the exact point where they are wanted and in formats that are more difficult to use in print. Moreoever, vocal inflection enriches the signal and enhances understanding. While the taped lectures usually represent a significant advance in preparation beyond the usual classroom lecture, they fall short, in most cases, of the preparation stage where the matter is committed to print. Consequently, future generations of college students probably are destined to listen to many hours of taped lectures.

If a practical method could be found for reducing the amount of listening time it would be a significant educational advance. Compressed speech recordings have been suggested as one means of reducing listening time without sacrificing learning efficiency. Essentially, speech compression involved the playback of recorded materials at faster than their original speeds, using some device to prevent the increased voice frequencies, or "Donald Duck" effect, usually associated with speeded playback.

In recent years, techniques of compressed speech recording have been developed which permit the shortening of playing time for recorded talk without distorting the voice frequencies. Two main methods have been used for speech compression, and there are advantages and disadvantages for each type. One simply deletes random mico-seconds of the tape, the amount of the deletions being predetermined to control the degree of compression. Another method selectively deletes material from the message, primarily pauses, and at the higher compression levels, portions of the sustained vowel sounds. When only the pauses are deleted, speech retains its normal tempo between pauses and is very easy to understand. Nevertheless, the rate at which the information is presented is speeded up and comprehension becomes a more difficult task. Of the two methods, the first retains the normal rhythms of speech so that comprehension may be easier. The second may be easier to recognize, but comprehension may be retarded. The second method is particularly useful for extemporaneous lectures, since useless pauses are omitted.

Prior research has generally established that, with some conditioning, people can be trained to comprehend the bulk of a message when the message is compressed to as little as 50% of the original speaking time.[1] This finding depends upon a number of variables including how comprehension or retention is defined, what method of compression is used, the speaking rate of the original message, the level of difficulty of the material, and the listening skill of the subjects. Moreover, it is generally understood that the information retained per unit of listening time is increased over uncompressed speech. Neither

of these findings, however, answers two important questions which confront the classroom professor. First, would students find enough satisfaction in the time saving to offset the extra attention required of them in compressed speech tapes. That is, would students prefer the compressed speech lectures, and if so, up to what compression levels? Second, although students assimilate more information per minute with compressed speech, will they assimilate a similar and satisfactory percentage of the total course information when compared with students using uncompressed speech. In other words, will they perform as well on exams? It is the purpose of this study to seek some answers to these questions.

METHOD

To answer the above questions the following procedure was devised. Lecture tapes for a general education course in Oral Communication were compressed. Eleven tapes were compressed by using the VOCOM I machine. It uses a selective compression method, deleting pauses and, at the higher compression rates, deleting portions of extended vowel sounds. It is impossible with the machine to predetermine the rate of compression, which depends on a number of speaker variables. Instead, the machine is instructed by the control setting to start and stop as it recognizes pauses longer than the threshold length. As a result, it is not possible to program the machine either for a certain percentage reduction in time, or for a certain number of words per minute.

The tapes compressed were mostly lectures, with several two- or three-person discussions also appearing in the compressed list. The

words per minute of the original tapes and of the compressions is listed on Table 1, along with the running times of each tape. The lecture tapes had been recorded in a studio, most read from manuscripts prepared for that purpose. Most were recorded at somewhat faster than ordinary speech, and as a result, the rate varied from 130 to 190 words per minute. The average is 176 words per minute.

When the tapes were compressed using varying degrees of pause deletion only, the compressed versions varied from 49% to 77% of the original recording time. The words per minute ranged from 200 to 324. When pause deletion was supplemented by deletion of parts of vowel sounds, the words per minute ranged from 308 to 375. This high compression was applied to only four tapes and machine records of usage were available for only one. All four were available for check-out in the library. No visual materials were used with any of the tapes.

In scheduling the tapes throughout the semester, we tried to increase the speed gradually so that the higher compressed rates appeared later in the semester. When maximum possible compression was achieved through pause deletion, a third version of four lectures was prepared using deletion of portions of long vowel sounds. In addition, during the first days of the course, a five minute orientation tape, prepared by PKM Corporation, was available to the students to help prepare them for the fast tapes.

It should be noted here that in the vowel compression mode, portions of vowel sounds are deleted from the tape by the VOCOM I. As a result, the voice frequencies at the point where the machine is stopped, and

the point where it is turned back on to accomplish a deletion, are slightly different. This produces unsmoothed juxtapositions of disparate vocal elements, and as a result, there develops an annoying popping sound in the very fast tapes, due to the exit and entry from a word in process. The resulting tapes are intelligible but not attractive, and for very high speed tapes, another compression method should be used. Student dissatisfaction with the very fast tapes, therefore may have been a function of the method used, rather than of the speed.

The approximately 200 students in the fall semester Oral Communication classes at ORU were used as subjects. All of them were informed at the beginning of the semester that a number of tapes would be available in compressed form on the dial access and information retrieval system. They would be available at exactly the same hours as the same lectures in their original form. The schedule of lectures on the dial system for each day would include a statement of the running time in minutes and seconds for each version of the tapes. The students then had the option of listening to either version in preparation for the next class period. The dial access machinery automatically recorded how many stations were dialed into each lecture and these totals were logged for each hour. As a result, it was possible to determine how many students had dialed into each version of the taped lectures. Although a given student might dial in several times, or several students might dial in once at one of the group listening stations, it was assumed that most students would dial in once and would listen alone. Any deviations from that pattern would contribute some random error in the data, but it was not considered serious. The results should

indicate, particularly in the long run, student preferences for one form or another of the tapes.

All versions of the tapes were made available in the library for student check-out for individual review purposes before exams. Each student, in order to receive a copy of the tape, had to sign a check-out card and these cards were retained. The total number of names on each card were tallied and compared, to see which versions were preferred for review. Moreover, the presence of the names enabled us to determine relative grade performance of the people using each type of tape.

About 25% of the course grade is based on performance on exams covering the taped materials. Since we could not determine who dialed in the compressed lectures, and student reports were apt to be biased, we instead compared final course grade with check-outs of the tapes, for which we had names. This gave a rough picture of the relative influence, if any, of the speeded lectures on course grade. We also compared class averages on the exams with the preceding semester.

Finally, since we were concerned with student preference, we solicited student reactions to the experience in an end-of-course survey. The questionnaire and tabulated results are shown in Table 2.

RESULTS

One major outcome of this study was the finding of no meaningful grade difference between those who used compressed tapes for review and those who did not. Each check-out of a tape was multiplied by the grade achieved in the course by that student, and the resulting total for each type of tape was divided by the total check-outs for

that type. The average grade (on a 4-pt. scale) of those using the compressed tapes was 2.87 and it was 2.82 for those using the original recordings.

Two, possibly offsetting forces, could account for a difference had one appeared. First, the better students may have used the faster tapes, which would tend to increase the average grade of those using the speeded lectures. Or, conversely, the poorer students, in an effort to avoid the longer lectures, might use the compressed lectures and learn even less. Either these forces were not operative, or they cancelled each other out, for only .05 of a point separated the two groups. Whether that difference is statistically significant is irrelevant, since it is not large enough to matter much practically. A further check of class averages found no meaningful differences between semesters.

The more critical finding concerned the preference of students, and that is not as simple. Overall, more students preferred the faster tapes, but not by overwhelming margins. (See Table 3 for summary of dial system records.)

There appeared to be no regular pattern of increased or decreased preference for the compressed tapes over the course of the semester. The taped discussions (rather than lectures) did show lower use of speeded tapes. Probably, the movement of the conversation among different voices added an element of uncertainty which required more effort to comprehend, and the speeded versions gave too little time to identify those different signals. This effect was most pronounced on the last two of the three discussion tapes. The average number of listeners to the original tapes was 72.5 and 92 for all compressed tapes.

The use of the compressed tapes was much more popular for review purposes. The speeded versions were checked out nearly three times as often. (447 to 165) Many students may have waited till review time to listen to the tapes at all, and speed at that point was critical to them.

Analysis of the students' questionnaires reveals more concerning students' preferences. These reponses are summarized in Table 2. The model student reported using 4-6 of the compressed tapes, though none were very high compression. Most did not use the tapes for review at all, but of those who did, most found the compressed version very helpful.

The mean scores on the last six questionnaire items indicate that:

a. Most students enjoyed using the compressed tapes at least some.

b. Most could understand the tapes without too much trouble.

c. Most felt the speeded tapes held their interest at least as well, and most thought they learned about as much from the taped lectures.

d. Many thought the compressed tapes created note-taking difficulties.

e. They did not know if the availability of compressed tapes for review could eliminate the need for taking notes.

A summary of the students' questionnaire responses by grade average is interesting. Responses of those reporting a college grade average of "C" or lower were compared with those reporting a college grade

average of "A". In general the differences were what one would expect. The brighter students used more compressed lectures, and they found them more helpful for review. They enjoyed using them slightly more, understood them more easily, were more interested in them and, felt they learned more from them. They thought it was harder to take notes than did the less successful students (who probably took notes less regularly anyhow), and were much more sure that speeded tapes would not eliminate the need for note taking. Since the results were predictable, and we were not trying to quantify these differences, no statistical tests of significance were attempted.

IMPLICATIONS

Two important conclusions can be drawn from these data.

1. Most students in their study, preferred to use the speeded lectures, at least up to approximately 300 words per minute. The time saving was considered significant enough by a large percentage that they chose compressed lectures when given a choice. Research elsewhere[2] indicates that gradual conditioning makes possible higher tape speeds without important information loss; consequently, the number preferring compressed lectures probably would increase with time in a setting where compressed lectures were used widely. Since, however, there is a substantial number of students who prefer the slower tapes, it would make sense to put only the fast tapes on an instructional dial access system, while letting those who prefer the slower tapes check them out from the library. This would effect a real savings in system time.

2. No important differences in students' grade performance were discovered when they were given the choice of fast or regular speed tapes. As long as the choice of modes remains, there may be no degrading of student performance. Our test procedure at this point, however, was not as rigorous as one could desire, and further testing is in order. This question was subordinated for our purposes to that of student preference.

Though this study was limited to audio materials, it would be interesting to replicate it with slide visuals added to the tapes in both compressed and original modes. Furthermore, work is needed to see what rates students would choose when listening to taped lectures if they could set the speech rate as they listened. A machine is now available which would permit such a study,[3] and it suggests exciting possibilities in flexible use of compressed speech for educational purposes. Moreover, it would be interesting to determine student preferences using high speed tapes compressed with a random deletion method.

FOOTNOTES

[1]See Rose Diamond and Richard Kinney, "The Place of Speech Compression in Academic Study," Proceeds of the Louisville Conference on Compressed Speech, University of Louisville, 1967. They found rates of 250 words per minute acceptable for blind students. Herbert L. Friedman, "Further Research on Speeded Speech as an Educational Medium, Final Report," ERIC, Ed 017 983, July 196[illegible]-Sept. 1967. Friedman found college students can learn to comprehend at better than twice the original recording rate, though up to 10 hours practice may be required. Dennis Edward Sarenpa, "A Comparison of Two Presentations of Rate Controlled Audio Instruction in Relation to Certain Student Characteristics," ERIC, ED 048 756, 1971.

[2]Friedman, op cit.

[3]Richard Kinney suggested the potential value of such a machine after his study with blind students (cited above), and the Varispeech I machine is an answer to that need.

TABLE I

Speaking Rate (WPM) and Running Time of Original and Compressed Tapes

TAPE UNIT	ORIGINAL	MODERATELY COMPRESSED	HIGHLY COMPRESSED
A	185 wpm (36:28)	228 wpm (25:20)	X
B	171 wpm (24:36)	261 wpm 15:53)	X
C	165 wpm (27:46)	244 wpm (17:18)	X
D	130 wpm (36:41)	200 wpm 28:04)	X
E	164 wpm (34:43)	311 wpm (18:02)	X
F	190 wpm (25:46)	324 wpm 14:54)	X
G	178 wpm (34:45)	309 wpm (17:12)	X
H	160 wpm (33:39)	243 wpm (15:13)	344 wpm (11:42)
I	141 wpm (37:53)	252 wpm (19:04)	375 wpm (13:08)
J	178 wpm (36:56)	253 wpm (21.50)	332 wpm (17:04)
K	155 wpm (30:42)	246 wpm (23:00)	308 wpm (16:32)
MEAN RATE TOTAL TIME	165 wpm (360 min.)	261 wpm (217 min.)	340 wpm (58 min.)

TABLE 2

GRAND TOTALS

SURVEY FOR COM 1013

The following items concern your use of the compressed versions of the COM 1013 tapes. We want to know if they had any value for you in your study in this course. You need not sign your name to this sheet. Please answer each of the following items carefully and honestly.

1. Your year in school (circle one): Fr. So. Jr. Sr. Special

2. Approximate grade average at ORU (circle one): A B C D F

3. Approximate grade in this course, as near as you can tell (circle one);
   A B C D F

4. There were about 14 lectures for COM 1013 which were available in compressed form. About how many of those compressed lectures did you hear?

		Median/Mode		
0-1	2-3	4-6	7-9	10 or more
(19)	(29)	(43)	(20)	(NA1)

5. A few of the lectures were available at normal speed, slightly compressed speed, and highly compressed speed.

   a. Were you able to make use of any of the highly compressed lectures?

	Mode	Median			
b. About how many?	0(46)	1(34)	2-3(30)	4 or more (16)	(NA 4)

6. Did you use the compressed tapes for review check-out from the library? If so, did you fnd the compressed tapes helpful for that purpose?

Median/Mode			
Very helpful (32)	Somewhat helpful (23)	Not very helpful (4)	Not Used (30)

7. Are there some courses where compressed tapes would be expecially useful? Name those courses.

TABLE 2 (Cont'd)

For the following items indicate the extent of your agreement or disagreement with each statement. If you don't know, or are neutral, or if the question does not apply, circle the middle response (#4).

MEAN								
	1. I enjoyed using the compressed tapes.							
(3.18)	Agree	1 (22)	2 (36)	3 (23)	4 (23)	5 (8)	6 (8)	7 (10)	Disagree
	2. I had no trouble in understanding the compressed tapes.							
(3.38)	Agree	1 (20)	2 (26)	3 (25)	4 (27)	5 (15)	6 (10)	7 (7)	Disagree
	3. The compressed tapes held my interest less than tapes of regular speed could have.							
(5.21)	Agree	1 (4)	2 (9)	3 (8)	4 (25)	5 (13)	6 (31)	7 (40)	Disagree
	4. I believe I learned less from the compressed tapes than I would have from the regular speed lectures.							
(4.74)	Agree	1 (9)	2 (6)	3 (11)	4 (35)	5 (13)	6 (29)	7 (14)	Disagree
	5. While listening to the compressed tapes, I found it difficult or impossible to take useful notes.							
(3.61)	Agree	1 (23)	2 (15)	3 (23)	4 (32)	5 (12)	6 (16)	7 (9)	Disagree
	6. I think if I could hear a compressed tape a couple of times I would not need to take notes.							
(4.02)	Agree	1 (4)	2 (10)	3 (29)	4 (43)	5 (7)	6 (25)	7 (12)	Disagree

TABLE 3

NUMBER DIALING EACH TAPE BY TYPE

Tape Units I.D. & Type	Original	Moderately Compressed	Highly Compressed
A Lecture	127	143	
B Lecture	94	135	
C Lecture	77	152	
D Discussion	50	101	
E Lecture	95	91	
F Discussion	78	72	
G Lecture	63	102	
H Lecture	65	61	43
I Lecture	38	58	
J Lecture	90	61	
K Discussion	68	67	
TOTALS	845	1043	43

Total Compressed 1086

Tape Units are listed in sequence presented to the class.

TABLE 4

NUMBER OF STUDENTS CHECKING OUT EACH TAPE UNIT FOR LIBRARY REVIEW

Tape Units I.D. & Type	Original	Moderately Compressed	Highly Compressed
A Lecture	22	46	X
B Lecture	29	34	X
C Lecture	12	28	X
D Discussion	29	30	X
E Lecture	13	50	X
F Discussion	16	43	X
G Lecture	13	35	X
H Lecture	16	34	18
I Lecture	16	26	20
J Lecture	19	25	19
K Discussion	7	26	13
Totals	165	377	70